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U. S. DEPARTMENT OF AGRICULTURE.

FIBER INVESTIGATIONS. REPORT NO. 2.

RECENT FACTS

REGARDING

THE RAMIE INDUSTRY IN AMERICA,

WITH BRIEF STATEMENTS RELATING TO

MANUFACTURE IN EUROPE, ETC.

BY

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RECENT FACTS REGARDING RAMIE.

In the annual report upon the fiber investigations of the Department for 1890 the statement was made that the culture of ramie was practically at a standstill, both here and in Europe, the knotty problem of economical decortication of the stalks when grown not having received satisfactory solution. Through the efforts of experimenters the situation has been changed somewhat in the past 6 months, and I wish to record at the present time the degree of progress that has been made during this period in the direction of establishing the industry.

In culture there is little progress to chronicle in the Gulf States, though two or three ramie companies that are interested in machines have been active in promoting cultivation. Without authoritative information concerning their operations, however, there is little to be said. A Southern company which has been working quietly, perfecting its machine, has small areas under cultivation for experimental purposes only. What others are doing the Department is unable to learn. As to individual effort, we do not hear of any considerable areas being put in the present season, nor has there been a demand for plants or for information regarding culture by Southern farmers that would denote anything like excitement upon the subject of ramie cultivation. There is a healthy interest, however, and no doubt a large number of farmers are ready to begin operations when assured of a money return for the crop when grown.

RAMIE CULTURE IN CALIFORNIA.

In California the interest in the subject, which was revived less than a year ago, chiefly through the exertions of those interested in the machinery question, has steadily increased, and at the present time considerable areas of roots are being planted.

I am informed officially that the demand for ramie roots at the State Agricultural Experiment Station at Berkeley still continues, although the supply is exhausted. The ramie beds are ample, however, and it is said will furnish a large stock of plants next fall. Many letters are received asking about the culture of the plant, and the interest seems to be increasing. In a recent report on the subject, by Director E. W. Hilgard, the following statements are made:

> Without discussing the merits of the different machines now offered to producers as a guaranty that their crop when grown will be convertible into a merchantable article, and of which I personally am not at present fully informed, it should be said

as regards the culture of ramie that by actual trial it has been found to be readily feasible in all the larger valley regions of the State, so far as the successful growth of the plant is concerned, but that it will doubtless prove most profitable where a long growing season, combined with irrigation, permits of making three or four cuts annually. In the Kern Valley there is little difficulty in getting *four* cuts of good size and quality, and the same is probably true on the stronger soils as far north as Fresno, and southward in the valley of South California. In Sacramento Valley *three* cuts can doubtless be obtained, at least when irrigation is employed, or in naturally moist land. At Berkeley and elsewhere on the immediate coast *two* cuts (the second usually a small one) are all that can be counted on; but in warm valleys of the Coast Range doubtless from two or three full crops, according to the supply of moisture and the strength of the soil, may be looked for.

An interesting table is appended, giving a record of crops of the white-leaved ramie (*Urtica nivea*) harvested on the experiment grounds at Berkeley during four years. It is stated that no manure was used on the plot, which was reset in 1888 in order to equalize the stand, which had been impaired by the distribution of roots; this accounts for a low product, and a later cut that year which will be noted. The size of the plots was 18 by 34 feet, or about one forty-fifth of an acre. Here is the table:

Results of experimental culture of ramie on the University grounds, Berkeley.

Date of cutting.	Plot.			Yield per acre.		Per centage dry to green.
	No.	Yield.		Green.	Dry.	
		Green.	Dry.			
First crop.		*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Per cent.*
June 24, 1887	1	576½	.....	25,835.7	.....	.....
July 16, 1888	1	491	135⅓	22,004.0	6,072.4	27.6
1889	1	624	133	28,616.0	6,095.2	21.3
July 9, 1890	1	763	122	34,194.0	5,471	16.0
July 9, 1890	2	623½	117	27,942.0	5,283.1	18.8
Second crop.						
Oct. 13, 1887		174	.....	7,797.8	.....	.....
Nov. 21, 1890	1	210	74	9,411.1	3,312.7	35.2
Nov. 21, 1890	2	210	74	9,411.1	3,312.7	35.2

It is explained that the green plants were weighed with leaves, which are estimated at about one-half* of the "live weight." The dry stalks were weighed practically leafless.

In the summary which follows, the product is set down at the average rate of about 5,700 pounds of dry stalks for the first cutting and 3,300 for the second. It is explained that the gross weight would naturally be somewhat less in the dry air of the interior of the State, the figures showing that on strong soils the expectation of 18 to 20 thousand pounds per acre where four cuts can be made is not extravagant. The minimum produce from dry stalks is estimated to be 15 per cent of raw merchantable fiber. Upon these data an approximate estimate of the crop and of its financial outcome in the several climatic regions of the State may be based.

*Mr. Hardy, director of the botanical garden of Algiers, gives the weight of leaves as five-twelfths the weight of the unstripped stalks.

Regarding soils and the question of keeping up the fertility of the land the following interesting suggestions are made:

It is hardly necessary to remind any intelligent farmer that only strong soils can be expected to produce, in one season, a crop of 10 tons of dry stalks of any kind, and that few can continue to produce such crops for many years without substantial returns to the land, no matter how fertile originally; but there is no reason why the offal of the ramie crop—the leaves and stalk-trash—should not be regularly returned to the soil. The leaves can be and are usually dealt with by stripping the stalks on the ground, leaving them where they grew. As to the stalks, it is true that with three or four cuts per season it will be difficult to deal with the large mass of refuse by spreading it on the stubble, although in the more northerly portions of the area of cultivation it may be desirable to use this material for protection against frost. But as the return must either be made, or fertilizers purchased, the proper mode of procedure will be to make compost heaps of the trash and thus render it less bulky, and convenient for spreading on the stubble after the last cut. This, in the case of strong soils, is all that will be required to keep up production for a long time, although the raw fiber sold represents a larger production of the soil's plant-food than in the case of cotton, in which the return of seed and stalk will maintain production indefinitely on any soil capable of yielding a profitable crop. When no returns are made, ramie will prove even a more exhaustive crop than is cotton when the seed is not returned, and those engaging in its cultivation had better understand from the outset that they can "rob the soil" with the ramie even more effectually than with the wheat.

One of the results of the revival of interest in the ramie industry on the Pacific coast has been the passage this spring of an act to encourage the cultivation of ramie in the State of California, and to provide a bounty for the fiber as well as to make appropriation for payment of bounties and for the salary of a State superintendent of ramie culture. The text of the first three sections of the bill is here reproduced.

The people of the State of California, represented in senate and assembly do enact as follows:

For the purpose of encouraging the cultivation of ramie in the State of California, there is hereby appropriated out of any money *in the State Treasury* not otherwise appropriated, for the forty-third *fiscal year, the sum of five thousand dollars,* and for the forty-fourth fiscal year the sum of *five thousand dollars.*

Said appropriation shall be under the direction and control of the State board of agriculture, and may be expended as said society may direct, either for the purchase of ramie roots for free distribution to farmers, or in payment of a bounty for *merchantable ramie fiber* (but no greater sum than one thousand dollars shall be paid in any one year for the purchase of ramie roots), and no greater amount than one cent per pound shall be paid as a bounty for *merchantable ramie fiber.* Any portion of said appropriation for the forty-third fiscal year remaining unexpended may be used by the State board of agriculture for the payment of bounties during the forty-fourth fiscal year.

The State controller shall draw his warrant upon the State treasurer for the amount appropriated for each fiscal year, in favor of said State board of agriculture, or the proper officers thereof, in the same manner as other appropriations are drawn upon and paid to said State board of agriculture, and the treasurer shall pay the same.

I understand that Mr. W. H. Murray, of San Francisco, has been named by the board of agriculture for the position of State superintendent as above. Mr. Murray has been interested in the subject of

ramie decortication for some time past, and conducted the exhibition trials of a machine at the State fair last year.

While this Department will follow with interest the progress of the industry in California, the fact remains that the question of culture was settled both in California and in the Gulf States long ago; and without an economical machine or process for securing the fiber when the stalks are ready for cutting the farmers are no better off now than they were before the bounty bill was passed. The State of New Jersey passed a bounty bill many years ago encouraging the culture of ramie as well as several other fiber plants which are adapted for culture in a northern latitude, and not a dollar of the bounty was ever called for by farmers or others. As a stimulus to the production of "the successful machine" (producing in *paying quantity*), the California ramie-culture act may accomplish certain results, though I would not dare hazard a prediction on the matter. If the present experiment is simply confined to promoting culture among farmers the results will not be very different from the results of former efforts in this country.* If the importance of the question of economical decortication, on the other hand, is fully appreciated, something may come out of the present "boom" that will show substantial progress. In the recent communication from the director of the State Experiment Station previously referred to, the statement is made that there is quite a demand not only for ramie but other textile plants. An experimental plat has been devoted to the culture of these plants on the grounds of the State capitol at Sacramento, to which the station has contributed a stock of the different kinds at its disposal.

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* In this connection I can not but reproduce an extract bearing pointedly upon the subject, from the ramie report issued by the Department of Agriculture a year ago.

"The Department, at this date, knows of no large market in this country where ramie fiber could be disposed of by farmers were they to produce it in quantity. Yet farmers are urged everywhere by interested parties to take up its cultivation, and we are in receipt of letters almost daily making inquiries upon the subject. A considerable number of the present inquiries come from those who know nothing of the past history of ramie cultivation in the United States, but who have been attracted to the subject by glowing accounts of the marvelous value of the plants as a textile, which have appeared in the columns of the press recently, and who are anxious to embark in its production. To these farmers its cultivation means the pursuit of a profitable new industry, and by holding out to such the golden promises that are frequently made in the journals of the day only injury can result and the final establishment of ramie cultivation among the masses of southern agriculturists be retarded. The object of making these statements is not to discourage farmers from going into ramie culture at all, but to induce them to take it up with their eyes open and to caution them to begin its cultivation on a small scale until they know something about it by practical experience.

"Undoubtedly there is a great future for the industry, and the Department will encourage Southern farmers to make small beginnings in order to obtain needed experience. When a satisfactory and full demand for fiber can be assured, and the decorticator question settled, it will be an easy matter to extend cultivation, and, if necessary, purchase machines for the decortication of the product. In spite of past

Reference has been made, in a former report, to the experiments of Mr. Charles Toppan, of the Toppan-Howland Company, of Boston, in ramie manufacture in this country. From recent correspondence I learn that Mr. Toppan has made contracts with responsible concerns for the manufacture of different kinds of ramie goods, to the amount of several tons per day of boiled stock. One yarn mill will run exclusively on this fiber, and it is promised that the ramie goods produced from this yarn will be on the market very soon after the first deliveries of fiber "from the boil." Carpets, sail duck, tinsel yarns, etc., are mentioned as immediate uses for this new textile.

A new use for the fiber is in the manufacture of "absorbent." It is stated that while cotton lint, specially prepared for this purpose, absorbs 37½ per cent. of water, actual tests show that ramie absorbs 87.9 per cent. This substance is already on the market.

THE RAMIE INDUSTRY IN MEXICO.

For a year or more past, or since the close of the Paris Exposition, there has been an active interest in the ramie question in Mexico, where, as in our own country, it has been demonstrated that the raw material can be readily grown in any quantity. The enterprise is conducted by a large company, and has had official support, and several gentlemen who are citizens of the United States are also interested in it. Last season there were trials of various machines for decorticating the stalks, but as far as the Department has been able to learn, both from private advices and published reports, these machines did not fulfill the promises made for them, and the enterprise was still to be regarded as an experiment.

The present seat of the industry is at Motzorongo, State of Vera Cruz, where some two months ago a very enthusiastic meeting was held, with an exhibition of ramie products. There was also a banquet and speeches. From the indifferent published translation of the speech of General Sewell on this occasion, some interesting points are brought out. The extracts are as follows:

> I do not permit my experience in various machines of decortication to influence my judgment, knowing that Senor President Diaz and Senor-General Pacheco esteem only the truth, and therefore are only interested in the solution of the problem. * * *
>
> Preoccupied by the paramount idea to convert into fiber the fertile shoots of the ramie which the first essays of the cultivation of the plant in Mexico presented to me, and corresponding to the desire of the gentlemen forming the now existing company, at this point I wish to have it understood that there is no time to take account of old methods, but to consider an invention which is destined to produce a beneficent revolution in this industry. * * *

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discouragements there is a great deal that is hopeful. The very difficulties that have stood in the way of successfully establishing the industry have spurred to greater effort. The question is being studied from new points of view and every aspect considered that may throw new light upon the subject, and new discoveries are constantly being made."

An instinctive sentiment leads me to believe that through the want of perfection of decorticating machines we are operating on a false plane. At the instance of Governor Gordon, governor of Georgia, a young inventor explained to me his ideas, which comprised a complete change from the old methods of decortication. It is a new system, admirable in its results, as it is greatly lucrative. Its machinery is costly, but conceived with great intelligence. It is rapid, economical in its manipulation, and once established will last a long time.

From these and other statements it has been inferred that while the machine trials of last year were not successful, that a combined mechanical and chemical process is under trial this season.

From private advices it is learned that Mr. Walter T. Forbes, of Atlanta, Ga., a valued correspondent of the Department, and a gentleman who has experimented in treating fibers for many years, is associated with the Mexican company and will conduct the experiments in decortication at Motzorongo. The process to be employed comprises, first, a very simple hand-stripping machine, which operates upon ten stalks at a time, the epidermis being removed. The strips then pass on to be degummed and finally bleached. I have no information as to the details of construction of the machine referred to, though it will doubtless be forthcoming in time. When in Paris, in 1889, I met frequently at the ramie trials and elsewhere Don Pedro I. Senties, a gentleman who has made a thorough study of the ramie question in Europe. It is a matter of congratulation to those interested in the Mexican enterprise that they will have the benefit of this gentleman's experience and knowledge of the subject to aid them in their efforts.

The Assistant Secretary, Hon. Edwin Willits, has just received from General Sewell, formerly of Oakbourne plantation, Louisiana, an interesting letter bearing on the more recent operations in Mexico, with this fiber, some extracts from which are presented herewith. Referring to his past experience with decorticators, he says:

Just at the moment when I was most perplexed how to overcome, not only the wood and epidermis evils and also how to obtain a more abundant fiber by the prevailing system of decortication, I became acquainted with Mr. Walter T. Forbes, of Atlanta, Ga., who desired me to examine his process that strips the ribbon from the wood perfectly and smoothly, speedily followed by degumming and bleaching; all accomplished within the short space of a few hours, and according to the size of the machinery, it is not difficult to produce over a ton and a half of fiber in a condition for the spinner to weave it.

The machinery is elaborate and costly, but so complete and convincing was what I witnessed, that I readily put aside all decorticating machines, my own included, and became a convert to the Forbes' process.

I found out to my cost that many writers in ramie literature were disposed to exaggerate the capacity of the decorticators, particularly if they invented one, and never took into account the yielding capacity of the land, etc. It is to be regretted that lovers of ramie culture and inventors of decorticating machines will, in their writings on that subject deal in the marvellous and in their illusory statements mislead well-disposed planters, and in the end materially create disappointment and disinclination to pursue cultivation.

About the time that I relinquished ramie culture in Louisiana I was invited to Mexico by high officials of the Mexican Government, commencing with Porfirio Dias,

President of the Republic, as well as Gen. Carlos Pacheco, Ministro de Fomento, to engage myself with them to cultivate ramie in connection with the "Campania Agricola e Industrial del Ramie," and was appointed general manager at the hacienda Motzorongo, with full power, under the title of director and administrator. It was under my management, being thus engaged, that I recommended the Forbes process, and extensive works were consequently established at Motzorongo, a land that yields five, I may say six, good crops yearly. The process was purchased from Mr. Forbes conditionally that it could do all it professed, and the authorities made a contract with Mr. Forbes that if the process was a success they would pay him for the patent. * * *

The factory was at once established under my administration and the coöperation of Messrs. Forbes and Streuby. These two gentlemen performed most effectually all they engaged to do, and consequently earned the full price agreed upon * * * and a success that has placed Mr. Forbes, the inventor, in a position to claim the first rank as an inventor of a process so long desired.

The factory in full blast was then placed under the strict inspection of commissioners, when tests were made showing clearly and positively that the fiber, ready for the spinner, could be produced at 12½ cents by the minutest calculation, Mexican, per kilo, which is equal to $0.0938 American, and as a kilo is equal to 2 pounds, American weight, at the present exchange, one pound of fiber reduced in Mexican would cost only $0.0469. And taking into consideration the heavy products of the land, say five or six crops yearly, it makes ramie cultivation exceedingly profitable in Mexico. And although Louisiana can yield only two crops and occasionally three crops yearly, the Forbes process would make it profitable to cultivate in Louisiana, because the ramie stalks in that State grow taller and stouter, and each acre would give a heavier yield than elsewhere.

The machinery of the present time, now erected at Motzorongo will yield over a ton and a quarter of fiber fit for the spinner during an operation of 10 hours. The test that was officially made 5 days ago, was presented to the board of directors and afterwards to a full meeting of stockholders. The purchase was then approved and the works are to be pursued vigorously.

I shall, as soon as possible, get the official report translated from Spanish into English and forward the same to you and to Mr. Charles Richards Dodge, and hope that you will find it both instructive and interesting.

I may now say, after this severe test, supported and approved by the Government of Mexico, that it leaves nothing to be desired in solving the problem of the ramie question. It is an acknowledged fact that ramie can be produced to meet a commercial demand at a large profit, which it could not compass under the limited and macerating process of decorticating machinery.

MACHINERY FOR DECORTICATION.

It has been a matter of regret to the Department that no opportunity was presented last year to examine and test American ramie machines, of which there are several that are said to do good work. As the matter now stands nothing is known regarding these decorticators further than has been put forth in claims of their inventors or by those who are interested in their sale. If the manufacture of these machines is regarded merely in the light of a commercial enterprise, as the production of something to be disposed of to the public in as large numbers as possible without regard to performance, a trial as to capacity for the benefit of the public will hardly be desired by their manufacturers. On the other hand, if the aim is to construct a decorticator

which will produce fiber in paying quantities, and thus enable farmers to go into ramie culture with a possibility of making it a money crop with other agricultural staples, not only should there be careful tests, under the eyes of experts, to learn the capacity of these machines, but competitive trials, as are frequently conducted in France and other countries where the effort is being made to produce a successful decorticator.

The Department is in correspondence with the manufacturers of two ramie decorticators who are anxious to present their machines for expert trial, and it is probable that they will be tested by the Department during the early summer. There are others, however, that the Department has been ready to test for a year past, and it is earnestly hoped that the opportunity may be presented before the close of the year. A competitive trial of all American machines is desirable, and a competition of this description would be productive of such beneficial results as would surely make an era of substantial progress in the ramie machine construction in the United States. The trials should be continued for a day of 10 hours, with careful weighings of stalks and of the fiber produced. The run should be continuous between given hours, without allowance for stoppages caused by the fouling of the machine, breakage, or other delays, and a number of points considered which in total would influence the rating of the machine after its performance. The Department holds that 10 minute tests upon a handful of stalks are of little value, as it must be a poor machine that will not show a good record under a 10-minute strain. It is not enough that a machine shall produce good fiber, for good fiber can be produced with a mallet upon a block of wood. It must produce fiber in *paying quantity*. It must work continuously without fouling. The fiber must be delivered straight, clean, and unbroken in its entire length. Bruised or snarled fiber entails large waste in the after processes. The machine should be portable, that the stalks may be cleaned in the field without necessitating large expense in the handling and rehandling of so bulky a crop. It must not be complicated. And lastly, it must be cheap enough to be within the reach of farmers of moderate means. When such a machine has been presented that will stand the proper tests, there is not the least doubt about the establishment of the cultural side of the industry, and manufacture will receive a stimulus by having a supply of fiber to work upon, which is the main hindrance now to the production of ramie goods in quantity.

Before leaving the machine question I wish to refer to the recent improvements in one of the French machines examined by me when in Paris, and reported upon in the Ramie bulletin published last year. The illustration represents Model A of the Favier machine, for green decortication, regarding which the following statements are made by the manufacturers.

The stalks stripped of leaves, and of any size or length, are intro-

duced into the machine, an operator being required at each end to feed the stocks and remove the fiber. The ribbons are delivered free from wood, parallel and unbroken, without waste. The number of stalks introduced varies from 60 to 100 per minute. Six to eleven thousand pounds of stalks may be passed through the machine in a working day, dependent upon the deftness of the operator. One horse-power is required to drive the machine, the refuse of the stalks being used for fuel. The machine is mounted upon wheels that it may be readily transported from one location in the field to another. Its weight is about 1 ton, and its cost is 2,000 francs, or about $400. A patent tax of about $60 a year is levied upon each machine sold during term of actual use by the purchaser, but the company "La Ramie Française" controlling the machines binds itself to purchase the decorticated product of the machines and keep the decorticator in perfect repair. The company makes the following claim as to performances:

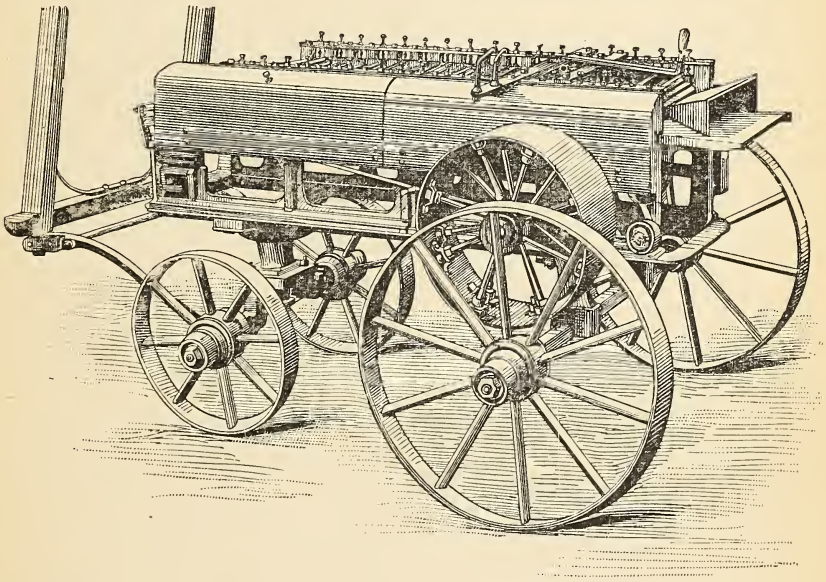

FIG. 1.—Favier machine for green decortication (model A).

Calculating upon three cuttings a year, and an average crop of 3,000 kilogrammes (6,600 pounds) of green stalks per hectare (2½ acres), and the use of the machine for 6 weeks at each cutting, one machine will suffice for six hectares (about 15 acres). Each hectare yields 1,500 kilogrammes of dry ribbons at a cutting, or 4,500 kilogrammes at three cuttings, worth from 40 to 45 francs per 100 kilogrammes, delivered at Marseilles.

This means in round numbers 10,000 pounds per hectare, or 4,000 pounds per acre, worth practically $80 or $90 per ton at the company's prices. Models B and C are also manufactured for decorticating the stalks in the dry state. They are considerably higher in price ($500 and $900), the capacity being relatively greater.

MANUFACTURE IN EUROPE.

Some interesting statements regarding the recent progress of ramie manufacture in Europe, by Dr. Karl Hassack, appeared in the Austrian Monatsschrift für den Orient for January, 1891, which gave important information especially regarding the state of manufacture in Germany. Of the French manufactures more has been known, particularly regarding those of Feray & Cie., at Essones, A. Goulon, at Rouen, and La Société de la Ramie Française,* which has its headquarters in Paris. The Department has also been in correspondence with the company operating at Emmendingen, Baden, which is limited in its production far below the capacity of its factory through inability to secure raw material. An extract from Dr. Hassack's article is herewith presented:

The slowness of the introduction of ramie into our industry can be traced to two causes: The scarcity of the raw material and the difficulty of obtaining a pure textile fiber. Until within a few years China was our only source, and there the exportation was limited by the large home consumption. In 1888 there were exported from China 108,095 piculs (about 6,800,000 kilogrammes), the larger part of which went to Hong-Kong and Japan, and only a small portion arrived in Europe. Of late, however, nearly all tropical countries have experimented with ramie culture, and some have reached very satisfactory results. At present ramie is raised in the Sunda Islands, the East Indies (particularly near Lahore), Algeria, Egypt, Cape Colony, the United States (in Louisiana), the West Indies, Mexico, Guatemala, Colombia, Brazil, and the Sandwich Islands. Java, Cuba, and Algeria already export ramie in considerable quantities. (According to a communication received from Mr. V. Seidlitz, Russian state consul, ramie is successfully grown in Transcaucasia.) Ramie is grown in southern France, Italy, and Hungary, but the prospect of ramie culture in Europe, is discouraging, as the plant requires a warmer climate for a remunerative crop. This general culture of the plant has lowered the price of raw fiber in the European markets from 160 to 170 francs a few years ago to 100 to 125 francs per 100 kilogrammes.

The second cause preventing a general employment of ramie, the difficulty of rapidly and thoroughly separating the fiber from the other plant material, is still partially in existence. A fine and workable fiber has been successfully prepared, but the methods are still too tedious and complicated, causing the price of ramie yarn to be high and consequent inability of competition with other industrial fibers.

The ramie—(*Urtica nivea*) is a shrubby plant similar to our common nettle. It sends up from a rhizome 10 to 15 shoots; these latter are from 1 to 2½ metres long, 1½ centimetres in diameter. The bark (*i. e.*, the bast or inner layer) contains the long fibers industrially used. The shoots are cut† close above the ground. In China decortication is done exclusively by hand, but in Europe machines are used for this purpose. The strips of bark thus obtained contain besides the fiber a large quantity of other tissues, as well as mucilaginous and gummy substances the removal of which is the task of the spinning mill. The dried strips of bark, or at best the raw strip of bast obtained from these are the raw material that reaches the European markets; the cleansed fiber reaching this market is practically worthless. Numerous methods

*The Department has in its collection many beautiful examples of the fabrics manufactured by this company.

†This cutting can, in tropical countries be done three or four, even six times annually, so that ramie culture must be considered highly remunerative. Special crop investigations are given in the author's monograph on "Ramie."

for cleansing and separating the pure fiber from the useless adherent matter have been proposed; considerable prizes have been offered for the invention of suitable apparatus. (A competitive prize was offered at the time of the Paris Exposition of 1890.) The Austrian ramie-spinning mill at Bregenz, which has been in operation since June, 1890, uses the patented methods of its director, Th. Eg. Schiefner, as does also the factory at Emmendingen (Baden). By this process there is obtained a fiber pale, of yellowish-white color and of silken luster. This fiber is prepared in combing machines for spinning, and is finally spun to yarn. Yarns are sometimes found in the market raw white (*écru*); they are generally, however, bleached or colored or "lustred" in the mills. The last operation imparts to the fiber its complete beauty and silk luster, while raw yarn looks rough and dull on account of numerous projecting fiber ends.

The ramie factory at Bregenz (represented here by the firm M. Igler's Nephew) and that at Emmendingen spin in single, double, triple, etc., thread the Nos. 10, 12, 15, 18, 20, 22, 24, 27, 30, 36, 40, 50, 60, 70, 80 (the prices varying according to fineness from 1.90 to 5.40 florins per kilogramme). The numbering corresponds to that of "*Chappe*" silk, the number accordingly expresses the number of 1,000 metres per kilogramme (*e. g.*, of No. 15 yarn 15,000 metres weigh 1 kilogramme). Remarkable it is that the specific gravity of ramie yarn is less than that of linen yarn in the ratio of 6 to 10, so that 1 kilogramme linen yarn No. 10 measures 6,000 metres, while the same weight of ramie yarn measures 10,000 metres. This peculiarity lessens the apparent difference in the price of the two yarns. On the other hand, ramie yarn is heavier than cotton in the ratio of 6 to 5.

Ramie yarn is easily distinguishable from other yarns by its high luster and silky appearance, in which it excels linen and cotton; ramie fibers are distinguished from all other fibers by their great length, usually from 10 to 15 centimetres (often 25 to 40 centimetres and more), by a certain straightness and stiffness, and by the considerable breadth of from 0.04 to 0.06 millimetres (flax 0.016, cotton 0.014 to 0.024, silk 0.009 to 0.029). The strength of the fiber is quite extraordinary, being about double that of hemp.

This last-named property of the ramie fiber brings it at once into prominence for the manufacture of ropes, cables, twine, and thread; in fact, in China it has been the common material for ropes and fishing nets for a long time, and the war department of France a few years ago introduced ramie for the manufacture of cables for war baloons and of powder sacks. Ramie is also being introduced as sewing thread. This thread is sold by the "Magasin de la Ramie à Paris" under the name of "Fil Hanio."

Ramie yarn has been used for various woven tissues, although many of these attempts have to be regarded only as interesting experiments. But for certain purposes ramie is most suitable; in the first place, for the manufacture of tissues that formerly were made of flax. In this respect it is not to be regarded as a substitute for flax, like the cheap and correspondingly poor cotton fiber, its high price precluding that at present. But "linens," damask, etc., made of ramie excel tissues made of flax, both in beauty of appearance and in strength and durability. This employment of ramie tissues is considerable in France, where several of the largest restaurants and hotels have introduced "table linen" made of ramie. The only disadvantage of ramie goods compared with linen goods is the fact that the former acquire after some use a certain roughness produced by fine, stiff, projecting fiber ends, and this peculiarity interferes with their use as body garments. The greatest obstacle to the general employment of ramie yarn for such purposes is the high price (20 per cent higher than linen).

In the wool and embroidery industry ramie is destined soon to find frequent employment with us, as it has already done in Berlin, Apolda, and Liengnitz; here ramie may successfully be made to imitate even silk. This is true also for the use of ramie for piano covers and table cloths, where it advantageously replaces the

tussah silk used for the ground of the design. Ramie will be used in the future for making furniture plush. Products of this sort made in France are distinguished by great brilliancy and softness. Finally, ramie is used in making Guipure curtains (so-called English curtains). An Austrian factory had begun employing ramie yarn for this purpose, and its manufactures bring out the brilliant luster of the material in the most exquisite manner. The use of ramie yarn in France has assumed considerable dimensions, especially in Les Vosges, Caudry, St. Pierre-lés-Calais, Roubaix, Lille, and Paris, and in Germany its employment is daily gaining ground.

Our (Austrian) home industry has, until recently, neglected this interesting subject, and has, at most, made a few isolated experiments. It is to be hoped that the recent introduction of the manufacture of ramie yarn within our own domain may stimulate the friends of this beautiful and valuable fiber to renewed efforts to place the manufacture of ramie tissues in the front rank of our textile industries, a place which is amply deserved.

FACTS REGARDING THE RAMIE INDUSTRY IN CHINA.

So many conflicting statements have been made, published and otherwise, regarding the methods of preparation of the raw fiber in China, as well as relating to the supply of commercial fiber, or in other words the raw fiber available for export, that in October last the Department wrote officially to Hankow, the chief shipping port of this product, for particulars upon these and other points. The reply is so full and interesting that it is published entire.

No. 27.] CONSULATE OF THE UNITED STATES,
Hankow, China, January 31, 1891.

Hon. J. M. RUSK,
Secretary of Agriculture, Washington, D. C.:

SIR: I have the honor to acknowledge receipt of your dispatch of 29th of October, 1890, to B. J. Franklin, who returned to the United States last May.

I have sent six samples of rhea grass to the consul-general in Shanghai with request to forward them to your Department, and the following is what I can gather in regard to the local process of handling same:

Rhea, China grass, or ramie (all synonymous terms) is grown almost exclusively in the basin of the Yangtse River, central China; Kiangsi, Hupeh and Szchuen, provinces lying between 30° and 33° N. L. and 100° and 115° E. L., are the principal districts. Hankow and Kinkiang are the shipping ports.

The soil on which it is grown is red clay with sand mixed in. The means of propagation with the Chinese is to dig up the roots in the fall, separate them in small bunches, and replant.

The plants are cut three times each year—in May, August, and October. The first crop is longer in fiber and better in quality than the latter two.

The preparing of the plant is all done by hand labor by the farmer. After cutting it is put into water and rotted, same treatment as with hemp, then it is beaten with a flail and broken, the bark being carried off with water.

From this point there are two processes of working. The light colored grass (samples 4 and 5) are dried over a charcoal fire, the others are sun-dried.

Samples 1 and 2 are used for making fish-nets and cordage, No. 3 for sewing twine, and Nos. 4 and 5 for grass cloth. No. 6 is raw state of third cutting merely dried with the bark on.

The Hupeh province product is the best for cloth, and the export from here has been confined to material like samples 2 and 5, No. 4 being too high-priced.

Sample 1 is green rhea from Szchuen province, and the present market price here is $130 to $135 (United States gold) per ton.

Sample 2 is green rhea from Hupeh province, and the price is $170 to $175 (United States gold) per ton.

	Per ton.
Sample No. 3 is Szchuen, price	$115 to $120
Sample No. 4 is Shausi, price	190 to 200
Sample No. 5 is Hupeh, price	118 to 125

To these prices must be added packing, insurance, freight, etc., from here to port of destination.

The amount to be had here for export is rather hard to determine. As soon as cut and cured it comes to market and is sold, no stock being held here.

The export from here yearly is now about 150,000 piculs, equal to about 10,000 tons, but this could be doubled if there was a sufficient demand.

The Chinese say the difference in color of the fiber is owing to the different locations and soils in which it is grown. This, however, the foreigners here seem to doubt; they lay it to the process of drying after the bark has been washed away, whether dried with charcoal, as is the case of the light-colored, or sun-dried, as in the darker.

The yarn for weaving cloth is all prepared by hand, and they have no difficulty in working it.

In England and France they are trying to work it by machinery, but so far have been unsuccessful, as there is a gum in the fiber which makes it very difficult to work by machinery.

The Chinese say this gum can be readily removed by soaking in hot water for a short time before using.

England, France, and Germany are the countries to which the "grass" is now sent, hardly enough going to the United States to serve for experimental purposes.

I am, sir, your obedient servant,

HENRY W. ANDREWS,
United States Consul.

CONCLUSIONS.

From this it will be seen that the statements regarding present available supplies, made by the Department over and over again, are fully verified. The entire export to all countries is now placed at 10,000 tons, "though this could be doubled if there was a sufficient demand." It doubtless has been largely increased recently, as 2 years ago the Department was informed, upon reliable authority, that 400 tons, during the last 5 years, would represent the maximum quantity brought to the European market from China, while India and other ramie-producing countries "have sent little more than sample lots and trial parcels." The reader is referred, however, to the statement of Dr. Hassack, on page 12, that in 1888 there was exported from China less than 108,095 piculs (a little over 7,000 tons), "the larger part of which went to Hong-Kong and Japan, and only a small portion arrived in Europe." This coincides with the statement of Messrs. Ide & Christie, the London fiber brokers, made in the preceding paragraph, and suggests the possibility that a part of the 10,000 tons, yearly export, goes to other markets than the countries of Europe named. But we are only indirectly interested in the Chinese culture. The American manufacturer should be able to obtain his supply at home, and the farmers of the South and of California should produce it, as they will be enabled to do, with a practical decorticator.

The following is an extract from President Porfirio Diaz's speech delivered to the Mexican Congress, in relation to the Forbes and Streuby Ramie process under the superintendence of Gen. L. Sewell, General Director of the Compañía Mexicana Agrícola é Industrial del Ramié:

It is only a very short time since the Ramie experiment has taken place in the fields at the Hacienda de Motzorongo. The results obtained by the Compañía Mexicana seem to be entirely satisfactory for in some regions of said company it will yield as much as six crops per year. Besides it is ascertained and with reason that the production will give good results in twenty-two States of the Republic.

Being helped efficaciously by Gen. Don Carlos Pacheco, Ministro de Fomento, the Mexican Ramie Company has in its possession different kinds of machines for the decortication of the fiber, but the apparatus and processes of Mr. Forbes, by its quickness and economy in the production of the fiber will assure considerable profits to the undertakers of this enterprise. Notwithstanding, there is plenty of hope to arrive soon with this process at a still more economical way of proceeding so that the fiber will compete most advantageously with the best products known up to this day. The company has already sent the first fibers extracted by this process to several factories in the country in order to make the study of their application in the weaving and spinning separately or mixed with wool, silk, and other threads.

If the results of the recent experiments in Mexico are fully verified, when the enterprise is fairly established on a commercial basis, we are nearer a solution of the question of economical decortication than we have dared to hope.

The world's progress towards the establishment of this industry has been slow, but some progress has been made each year nevertheless, and the Department is hopeful that full success will be attained in a future not remote.